

XIII. *On some of the Difficulties of Entomological Students, as exemplified by recent Experience in the Genus Elachista.* By H. T. STAINTON, Esq.

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A VERY useful paper by M. Godet appeared in the first volume of the "Annales de la Société Entomologique de France," p. 34, entitled "Quelques Observations sur la Manière de travailler en Histoire Naturelle, et en particulier sur les Monographies." The object of this was, as its title implies, to point out the best way to proceed in working out groups monographically; and this paper may be read with real advantage by *students* at the present day, and none can read it without pleasure.

M. Godet says at page 39, "Pour faire une bonne *Monographie*, il faut avoir une connaissance exacte de l'anatomie du groupe d'insectes dont on s'occupe, faire l'histoire de leurs transformations, de leurs mœurs, de leurs habitudes, des substances végétales ou animales dont ils aiment à se nourrir. Il faut lire les ouvrages de tous les auteurs qui se sont occupés du groupe qui fait l'objet des travaux du monographe. A cette partie se rattache la *synonymie*, si souvent négligée et si éminemment nécessaire. . . . Ce n'est qu'après s'être enrichi d'une masse d'observations faites par d'autres ou par lui-même que le monographe doit procéder sérieusement à la fixation définitive des espèces, à l'énoncé de leurs caractères, à leur description et à l'établissement des groupes artificiels ou naturels."

How true all this is, all who have worked monographically must have felt, and must have found it no light task they had undertaken.

To chronicle observations made, to describe specimens placed before one, is one thing; but to define the limits of the variations of species, to make the observations necessary to supply some gap that is perceptible, are very different matters, and the monographer has this to do, or he fails of his intended end. Passing over the "connaissance exacte de l'anatomie du groupe," I wish to offer a few remarks on the second point, "faire l'histoire de leurs transformations." To do this, it is necessary to know, 1°. Where the egg is laid; 2°. How soon it is hatched; 3°. How long the larva lives before changing its skin; 4°. What change (if any) in the form and markings of the larva takes place when it changes its skin; 5°. At what period the larva will be full fed; 6°. What

change takes place in its appearance when full fed; 7°. Where it changes to pupa; 8°. What amount of cocoon it makes; 9°. What is the form of the pupa; and 10°. How long it remains in the pupa state.

But besides "l'histoire de leurs transformations," we require that of "leurs mœurs, leurs habitudes." 1°. Is the larva gregarious or solitary? 2°. Is it active or sluggish? 3°. Does it feed by night or by day? 4°. Does it construct any cell or gallery in which it feeds? 5°. Is the pupa lively or not? 6°. Does the perfect insect fly willingly? 7°. What are its motions in flying and walking? Neither does this by any means exhaust the subject; for "il faut faire l'histoire des substances végétales ou animales dont ils aiment à se nourrir." 1°. What is the food-plant of the larva? 2°. On what other plant is it sometimes found? 3°. What other plants will it eat when in captivity and its natural food cannot be supplied?

Now, to answer all these questions with reference to any one species is no easy matter, but to answer them with respect to a whole group requires a vast amount of methodized, systematic observation; for we must notice not only what we do see, but what we do not see. To ascertain that a species is not double-brooded, we must seek for the second brood, and notice that we *do not* find it. All this requires time, patience and perseverance.

Now, to apply the foregoing remarks to the genus *Elachista*, belonging to the *Tincina* division of *Lepidoptera*. Of this genus the larvæ were entirely unknown to us till the spring of 1853, when it was discovered that they mined the leaves of grasses,—a very natural habitat certainly now that we know it, but one which our inductive powers failed to point out to us till accident led to its discovery. Then various grasses were searched with great diligence, and with the exception of the flat-stemmed grass (*Dactylis glomerata*), which was soon found to produce more than one species of *Elachista*, it was assumed that each different grass was the pabulum of a different species of larva; consequently at the close of the season of 1853 it was received as a settled point that certain grasses were the food-plants of certain species of *Elachistæ*.

In a science of observation we first observe an occurrence; we then deduce from that observation certain probable events, which we expect will come to pass, and proceed to repeat our observations to see if it is so. Thus the present season became the touchstone for the discoveries of last year among the *Elachistæ*. The result has been that much that had been considered settled

has become unsettled, and that there is less confidence in the stability of the new discoveries.

Thus it is found that several of the larvæ (and may not this observation extend to all) are at first very different in form and markings from what they afterwards become; so that from a figure and description of the young larva, the adult larva of the same species would never be recognized.

It is also found that larvæ, supposed to be exclusively attached to individual grasses, feed indifferently on various other species of the *Gramineæ*; hence several different species of larvæ sometimes feed in the same grass; and, further, it is found that it is not the *Gramineæ* only that the larvæ of this genus frequent, but many species are attached to the *Cyperaceæ*.

But to perplex us still further, a species which no one had suspected of any difference of habit, *Elachista Treitschkiella*, has in the larva state so peculiar a mode of feeding and living, that to retain it along with the graminivorous species exceeds all our notions of generic propriety.

This larva was first noticed two years ago mining at the end of summer in the leaves of the dogwood (*Cornus sanguinea*), and making large blotches. Its appearance, however, was so little that of a Lepidopterous larva, that we felt much disposed to regard it as "only some beetle larva," till accidentally observing one in the act of cutting out its case, we were led to examine a little more closely, and we found that in all the empty mines there was a small elliptical hole cut out of the leaf at one end of the mine. Plainly, then, it was the rule for these larva, after ceasing to mine, to use a piece of the leaf wherewith to construct a case. This case is formed of two oval pieces, one being cut from the under, the other from the upper side of the mined place, exactly opposite to each other. The larva lines them with silk, and fastens them together securely at the sides, leaving only a small opening in front and behind. The case is then detached, and descends to the ground, and it was anticipated the larva would there have continued to feed like the larvæ of *Incurvaria muscella* and *pectinea*. (Hence I have mentioned this larva in my 'Entomologist's Companion,' second edition, p. 53, under the genus *Incurvaria*.) However, as far as we have observed, the larva does not feed at all after quitting the leaf, but remains quietly in its case, and does not change to a pupa till the following spring.

Of the larvæ collected in 1852, only one attained the pupa state, and that never came out as imago. Of the larvæ collected last

year, several have now been bred by Mr. Boyd (who exhibited a specimen at the June Meeting of the Society), by Mr. Douglas and by myself; and the imago proves to be *Elachista Treitschkiella*, of which a figure and description appeared in the concluding number of Fischer von Röslerstamm's excellent work (Pl. 100, fig. 4, p. 297). The position of the insect when at rest is rather different from that of other *Elachistæ*. The wings meet at a more acute angle over the back, as in the genus *Tinagma*, which in the "Insecta Britannica," p. 179, I have on that account compared to *Cilix spinula*.

Elachista Treitschkiella was so rare in our Collections, that at the time of writing the *Insecta Britannica* I had only seen two old specimens, in Mr. H. Doubleday's Collection; two others were subsequently discovered in the late Mr. Stephens's Collection, when the British *Tineina* of the British Museum were being re-arranged.

It seems strange now that the transformations of an insect, which in its larva state, from its extreme peculiarity of habit, is so very noticeable, should have so long remained unknown, not only here, but on the Continent,* where the perfect insect had been observed swarming round the *Cornus* bushes; but it is even still stranger that a larva, with a precisely similar habit, should have been observed and described upwards of a hundred years ago. The original description, which I have not had an opportunity of seeing, occurs in the "Mémoires de Mathématique et de Physique, présentés à l'Académie Royale des Sciences, par divers Savans," tom. i. p. 177 (4to. à Paris, 1750): it is referred to by De Geer, tom. i. p. 449, and by Goeze, in the "Naturforscher," Stuck iv. p. 16; the latter writer repeats the whole of the history of the insect, which appears to have been contained in a letter from Godehen de Riville, Commander of Malta, to Reaumur. As it is this reflected light only that has reached me, we see the use of such transcripts; and as the "Naturforscher" is not always accessible, nor is it to all intelligible, I hesitate not to swell the bulk of this paper by transcribing a large portion of the notice.

"I now relate to you the history of a larva mining the vine leaves, which probably you do not meet with in the neighbourhood you explore, as you have not mentioned it in your notes. This deserves a special place in the history of these insects, because it belongs to none of the seven classes into which you have divided the larvæ known to you. On the 25th July I went into

* The larva had been observed by Herr Boie (*Ent. Ztg.*, 1846, p. 292) on *Cornus stricta*, but he did not rear it, and was not aware to what order it belonged.

the garden of a friend, and, as I was walking among the vines which surround the house, I found, to my great delight, that a certain insect had mined these leaves, at first in slender galleries, but afterwards in great blotches. But the most singular thing was that the mined place, at the side where the insect had last inhabited, had an elliptical hole of moderate size. The two skins of the leaf appeared to have been cut away, as though by a knife. I immediately thought this must be the work of a larva, which has formed its cocoon with the two pieces of the skin of the leaf, and has afterwards removed from its first place of abode—a suspicion which I soon confirmed, since, when I looked at the leaves from below, I soon perceived on them, as also on the stems, several oval cocoons, which were nearly the size of the previously observed holes in the leaves.

“The way in which these cocoons are suspended deserves to be noticed; they hang merely by one end, and always with the disc perpendicular to the object to which they are attached. I contented myself for the present with collecting about thirty of these cocoons; from many had the perfect insects already escaped. In one I found a pupa; it was amber yellow, the six feet (of the perfect insect) were already distinctly visible. The wing cases were here not protruded in front as in other pupæ, but are as long as the body, and lie on it almost like the wings of birds, in such a way that the two ends of the body and the wing cases form, at the hinder end of the pupa, a very perceptible angle. I examined several more of these cocoons, in order to convince myself fully of what I had seen, and afterwards replaced the pupæ in their cocoons, which I had opened at the side, in order that they might not be too much injured. Among four that I examined, two had lost their yellow colour and become black and white, which led me to think that the perfect insects would soon be out. Accordingly, on the following morning two had already appeared, the remainder came out gradually from day to day, and after nine days I had bred eighteen moths from my thirty cocoons. After examining them with the glass, they appeared to me to belong to the third class of moths, which carry their wings like the wings of birds, but have behind a higher margin on them, which forms, as it were, a cock’s tail. They are beautiful creatures, of which the feet, head and body are, as it were, silvered. The ground colour of the wings is a beautiful black; each is adorned with four triangular silver spots, of which two are on the inner margin, two on the costa.

“One may easily imagine I was not content with this discovery.

I was extremely anxious to see the work of the larvæ, how they make their cocoons, and bring them to the place where they wish to hang them; with this view I collected from the garden many vine leaves, placed them with the stems in glasses of water, and put them so against the light that I could with ease observe the movements of the larvæ; and, since I had a supply of them, I wished also to observe the larva itself, in order to see to which class it belonged. I ripped up, therefore, the upper skin which covered them, and brought three or four to light; but what was my astonishment when I examined them one after another, and found neither legs nor prolegs. An apod larva, thought I; an unknown monstrosity. The suspicion therefore came across me: there may be two sorts of larvæ in the leaves, and I have probably stumbled upon some dipterous mining larvæ. I waited therefore for a convenient opportunity to solve my doubts; two larvæ were some hours afterwards about to make their cocoons, and I was an attentive spectator of their work; each drew off his from the leaf, and, after wandering about for a time, made a stop under a nerve of a leaf, and hung up its cocoon. This happened in about three-quarters of an hour. Since I knew for certain that larvæ were within, I cut them open, and by this learnt that the previous insects I had were truly apod Lepidopterous larvæ, since these were exactly like them. I examined them with a lens of two lines focus, but could discover no feet, twist and turn them as I would; not being satisfied, I placed them under a powerful microscope, but could not observe feet on any of the segments."

Here I cease my extract, but those who feel curious will find several pages more in the original; and I should here mention that no feet are perceptible in the larvæ of *Elachista Treitschkiella*! The larva of the vine leaves is certainly congeneric with that of the dogwood, but, not passing the winter in the larva state, is easier to breed. The perfect insect is at the present day entirely unknown to us; but surely it can be no difficult matter for Entomologists who reside in wine-growing countries to re-discover this interesting species, for which I beg to suggest the name of *Elachista Rivillei*, in honour of its discoverer, whose observations would be creditable in any Entomologist at the present day, whilst the reflection that they were published in 1750 may well overwhelm us with astonishment.
